

Effect of Abiotic Factors Against the Infestation of American Bollworm (*Heliothis armigera* Hub.) on Different Varieties of Cotton under Unsprayed Conditions

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Abstract: The study was conducted at Nuclear Institute for Agriculture and Biology (NIAB), Faisalabad. There were eight cotton varieties namely, N-K, K-1, K-2, FH-109, MNH-554, N-86, N-98 and CIM-482. The study was conducted to see the effect of abiotic factors against the infestation fluctuation of American bollworm on different nectarid and nectariless cotton varieties under unsprayed conditions. American bollworm infestation on squares and green bolls was maximum on N-98 and CIM-482 in 2nd and last week of September, when the temperature was 32.06 and 30.11°C, relative humidity ranges from 59.21 and 57.42% and rainfall was only 0.10 and 0.0 mm. The minimum infestation was recorded on nectariless varieties i.e., K-1, N-K and K-2 in the month of August. The results concluded that correlation between infestation and weather factors indicated that temperature and relative humidity affected positively while the rainfall was negatively correlated on different varieties under unsprayed conditions.

Key words: *Heliothis armigera* infestation, abiotic factors, cotton

Introduction

Cotton plays a vital role in the economy of Pakistan. It is leading cash crop and primary input to the country's largest industrial sector. It earns major part of our foreign exchange upto 62.3-68.3% (Khan and Khan, 1995). This crop is handicapped due to the infestation of cotton bollworm complex among which American bollworm considered as limiting factor in the production of this crop. So, the development of resistant nectariless cotton varieties is an important strategy against bollworms complex. However, the resistant in plant is not governed by any single factor but it is a combination of physical and environmental factors. The previous information about the interaction of infestation level with climatic factors has been provided by Kadam and Khaire, 1996; Dhawan and Simwat, 1997; Patel *et al.* (1998). The present studies was under taken to establish relationship between Abiotic factors and American bollworm infestation on different Nectaried and Nectariless cotton varieties.

Materials and Methods

Eight cotton varieties viz., NIAB Karishma, (N-K) Karishma,-1(K-1) Karishma-2, (K-2) (Nectariless),

FH-901, MNH-554, NIAB-86, NIAB-98, CIM-482. (Nectaried), were tested in replicated trial following randomized complete block design (RCBD) with a plot size 31x24 m. The data of American bollworm infestation were recorded from squares, and green bolls from five randomly selected plants from each treatment starting from 22-08-01 to 15-10-01 on weekly basis. At the end of season, the data were statistically analysed in such a way, so as to determine co-efficiency of correlation among different variables considering the role of abiotic factors and the role of nectarid and nectariless resistant cotton varieties against the infestation of American bollworm under unsprayed conditions.

Results and Discussion

Data regarding infestation of American bollworm, given in Table 1, revealed significant differences among different cotton varieties with observed abiotic values. However, it was noted that mean percent infestation of American bollworm on squares and bolls was significantly higher on V₇ and V₈ in the 2nd and last weeks of September when the temperature was 30.62 and 30.11°C, relative humidity ranges from 59.21 and 57.42% and rainfall was only 0.10 mm. Similar results were obtained by Chaudhari *et al.* (1999). However, nectariless varieties like N-K, K-I and K-2 were found to be less attacked as in the finding of Satpute *et al.* (1994). The minimum infestation of American bollworm were recorded in the 3rd week of August and in the 2nd week of October when the temperature was 28.23 and 28.31°C, relative humidity was 79.78 and 46.91% and the rainfall was 9.30 and 0.00, respectively.

Correlation among weather factors and infestation level on squares and green bolls shown in Table 2. It was indicated that mean air temperature and relative humidity were positively correlated with infestation while rainfall was negatively correlated. Similar results were obtained

Table 1: Overall mean infestation of American bollworm on different nectaried and nectariless cotton varieties on different dates with observed abiotic factors

Dates	Nectariless varieties						Nectaried varieties			
	V ₁ (N-K)		V ₂ (K-1)		V ₃ (K-2)		V ₄ (FH-901)		V ₅ (MNH-554)	
	Sq	Bolls	Sq	Bolls	Sq	Bolls	Sq	Bolls	Sq	Bolls
22-8-01	1.23	1.92	1.98	2.13	1.56	2.56	2.86	3.91	1.89	4.12
29-8-01	1.37	2.12	2.12	1.86	1.98	1.99	2.95	2.12	3.15	4.10
06-9-01	9.44	4.14	8.16	6.64	8.82	6.91	8.95	8.51	9.66	9.02
13-9-01	9.16	8.25	8.12	6.35	8.16	4.88	10.17	8.12	12.14	8.13
20-9-01	2.86	2.26	3.12	3.86	2.20	2.11	6.15	3.86	8.12	3.91
27-9-01	8.15	8.01	6.96	4.85	8.99	4.35	9.25	9.11	9.16	8.23
4-10-01	5.86	3.32	5.25	3.31	3.12	3.31	6.23	2.86	12.12	4.15
9-10-01	2.02	2.90	3.37	2.24	2.15	2.04	3.15	2.56	2.10	2.50
15-10-01	2.23	2.53	2.86	2.26	2.19	2.01	3.00	2.06	2.40	2.16

Table 1: Continued

Dates	Nectaried varieties						Abiotic factors				
	V ₆ (N-86)		V ₇ (N-98)		V ₈ (CIM-482)		Means Sq. of whole cotton	Means bolls of whole cotton	Temp. (°C)	R.H. (%)	Rainfall (mm)
	Sq	Bolls	Sq	Bolls	Sq	Bolls					
22-8-01	2.89	6.87	3.56	8.39	3.31	4.81	2.41 c	4.35 c	28.23	79.78	9.30
29-8-01	3.39	5.12	8.16	8.01	5.02	4.66	3.54 c	3.62 c	32.38	68.57	0.00
06-9-01	16.16	12.13	18.19	12.84	15.24	18.26	12.86 a	9.80 a	32.06	61.68	0.12
13-9-01	11.24	15.84	21.19	20.16	19.55	18.16	12.46 a	11.23 a	30.62	59.21	0.10
20-9-01	8.25	8.01	16.12	9.35	12.03	8.37	7.61 b	5.07 b	28.95	57.92	0.11
27-9-01	16.12	15.10	18.66	15.83	17.01	15.91	12.05 a	9.67 b	30.11	57.42	0.00
4-10-01	14.11	9.65	8.50	8.01	10.00	6.87	8.14 b	5.18 b	30.08	48.35	0.00
9-10-01	3.13	3.00	3.40	3.33	3.31	3.51	2.82 c	2.76 c	29.52	53.50	0.00
15-10-01	2.05	2.13	2.00	3.01	1.98	3.68	2.38 c	2.45 c	28.31	46.91	0.00

A = High infestation, b = Moderate infestation, c = Low infestation

Table 2: Correlation coefficient values between American bollworm infestation on different cotton varieties and abiotic factors

Varieties	Air temperature		Relative humidity		Rainfall	
	Squares	Green Bolls	Squares	Green Bolls	Squares	Green bolls
V ₁ (N-K)	0.261 NS	0.354 NS	-0.444 NS	0.576*	-0.159 NS	-0.202 NS
V ₂ (K-1)	0.277 NS	0.435 NS	0.312 NS	0.473 NS	-0.225 NS	-0.315 NS
V ₃ (K-2)	0.525 *	0.375 NS	0.714 **	0.375 NS	-0.116 NS	-0.198 NS
V ₄ (FH-901)	0.566 *	0.525 *	0.651 *	-0.499 NS	0.344 NS	0.271 NS
V ₅ (MNH-554)	0.466 NS	0.612 *	0.502 NS	0.679 *	-0.128 NS	-0.338 NS
V ₆ (N-86)	0.825 **	0.712 **	0.741 **	0.633 *	-0.650 *	-0.498 NS
V ₇ (N-98)	0.888**	0.735 **	0.654 *	0.545*	-0.575 *	-0.523 NS
V ₈ (CIM-482)	0.766**	0.891 **	-0.456 NS	0.412 NS	-0.467 NS	-0.411 NS

* = Significant, ** = Highly significant, NS = Non-significant

by Rajaram *et al.* (1999), Sadaany (1999), and Han (2000). Moreover it was noted that the cotton varieties had highly significant correlation values with air temperature and relative humidity while non-significant values in case of rainfall. These results favour the results of Nasir (1986), while contradictory to Jha and Bisen (1994).

It also be concluded that there might be a number of other factors too that influence the American bollworm infestation; these can be physio-morphological or bio-chemical factors that may correlate with each other to have some positive or negative effect to influence the infestation of American bollworm.

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